COUPLING PIECE FOR JOINING TWO CONTAINERS THAT ARE STACKED ONE ATOP THE OTHER, ARRANGEMENT OF CONTAINERS THAT ARE STACKED ONE ATOP THE OTHER, AND METHOD FOR JOINING CONTAINERS THAT ARE STACKED ONE ATOP THE OTHER USING COUPLING PIECES OF THIS TYPE

Specification:

The present invention pertains to a coupling piece for joining two containers that are stacked one atop the other, particularly onboard ships, at their corner fittings, comprising a stop plate and a coupling projection on each side of the stop plate, of which the first coupling projection can be placed on the corner fitting of one container and the other coupling projection is provided with a locking catch for locking inside a corner fitting of the other container. Furthermore, the present invention pertains to an arrangement of containers that are stacked one atop the other, and to a method for joining containers that are stacked one atop the other with coupling pieces of this type.

Such a coupling piece is known, e.g., from DE 298 11 460 U1. This coupling piece is a so-called midlock, which is used for lashing containers as deck cargo onboard ships, especially for joining two containers stacked one atop the other. The midlock is used whenever two 20-foot containers are placed on a space for a 40-foot container, namely at the container corner fittings on the front sides, facing one another, of the 20-foot containers, standing one behind the other. In fact, only a very narrow gap of about 76 mm is produced between the 20-foot containers standing one behind the other, such that the corner fittings arranged on these sides and therefore the midlock as well are poorly accessible for stevedores. The corner fittings are freely accessible on the other, free front

sides. So-called twistlocks are generally used here, which are opened manually by the stevedore when unloading the container. The container is then raised, whereby the midlocks slide out of the corner fittings of the lower container because of the inclined standing of the container.

During the loading of the container, the midlocks are first suspended in the lower corner fitting of the upper container with the containers hovering over land. To this end, in older variants, hook-type catches were used on a front side (the side pointing in the longitudinal direction of the container to the front side of same) of the upper coupling projection. More contemporary variants, such as, for example, the midlock also illustrated in DE 298 11 460 U1, have lateral projections on the upper coupling projection that extend approximately in parallel to the stop plate. These projections grip into the lower corner fitting of the upper container. The opposite, lower coupling projection has a locking catch on a front side. When the upper container is placed on the lower container which is already located onboard the ship, either the entire midlock then slides against the upper container or the entire upper container slides forwards or backwards on a lower inclined surface of the locking catch and catches in the upper corner fitting of the lower container during the further lowering of the container.

This midlock has the following drawback. Usually onboard ships, the rear container corner fitting, into which a midlock is usually inserted, is poorly accessible, as explained above. However, there are also container ships, in which the containers are still accessible at least at some of the loading spaces, or because not all loading spaces are occupied, for attaching additional lashing means, for example, lock rods. However, in the prior-art midlocks, lashing means cannot be fastened in the upper corner fitting of the lower container, since the front-side opening is occupied because of the

locking catch engaging therein. For this reason, a special hook fitting of a lock rod is suggested in DE 100 04 359 A1, which grips around the locking catch of conventional midlocks. Up to now, this hook fitting has not been used in practice.

Based on the above, the basic object of the present invention is to create a coupling piece as well as an arrangement of containers stacked one atop the other and a method for joining containers stacked one atop the other, in which the front-side opening of the upper corner fitting of a container remains free for lashing means.

To accomplish this object, the coupling piece according to the present invention is characterized in that the locking catch, viewed in the longitudinal direction of the container, is arranged laterally on the other coupling projection. The arrangement according to the present invention is characterized in that the containers are joined with one another at least at the corner fittings of a front side of the container with the coupling piece according to the present invention each. According to the method according to the present invention, the upper container is swung horizontally about its vertical axis, or, as an alternative, is offset laterally when coupling and/or uncoupling with the lower container.

Because of the lateral arrangement of the locking catch, the front-side bore hole of the corner fitting of the lower container remains freely accessible for lashing means. The locking catch is assigned to a lateral opening of the corner fitting which is not usually used for lashing containers onboard ships anyway, where it therefore also does not lead to interference.

However, the measure according to the present invention offers another advantage. As is explained

above, 20-foot containers are joined with one another on loading spaces for 40-foot containers by means of two different fittings by stacking one atop the other, and especially with two midlocks, on the one hand, and with two twistlocks, on the other hand. Thus, different fittings must be provided onboard the ship. Moreover, a twistlock that is inadvertently used instead of a midlock can often be removed only with difficulty. Therefore, efforts have been made in the past to create a universally insertable fitting, a so-called universal lock (also called unilock), which can be universally inserted at all positions. An example of the universal lock of this type is the subject of DE 101 05 785 A1. The universal locks proposed until now have not yet found a good footing in practice. Furthermore, they have the drawback that, when unloading the container, the stevedore must always still manually open the universal lock at the accessible container corner fittings ("twistlock position"), so that it is unlocked with the upper corner fitting of the lower container.

In order to prevent this and to create a coupling piece that can be unlocked without the involvement of stevedores, so-called fully automatic devices were proposed in DE 43 07 781 A1 and in WO 01/76980 A1, in which movable locking elements are provided. These locking elements move as a result of movements of the ship, particularly rolling movements, during travel and thereby lock the coupling piece with the upper corner fitting of the lower container. In WO 01/76980 A1, a ball movable in a cage is provided as the locking element. In DE 43 07 781 A1, it is suggested to use a pivotable block, which pivots from one side to the other depending on the position of the ship, and thus interlocks under the elongated hole of the upper corner fitting of the lower container. In this case, the locking elements are provided such that, when the ship is at rest, i.e., in the harbor, they automatically reach a rest position, in which they unlock the coupling piece with the upper corner fitting of the lower container, so that the upper container can be unloaded.

However, the drawback of these fully automatic devices is that the movable locking elements are very susceptible, in particular, to dirt. Therefore, these fully automatic devices are very trouble-prone even with good maintenance.

A coupling piece equipped with the features according to the present invention can also be used as a fully automatic device. A coupling piece each is inserted into all four lower corner fittings of the upper container. Using four coupling pieces of the same design automatically results in the locking catches pointing in different directions on the "front" corner fittings, on the one hand, and the "rear" corner fittings, on the other hand. When placing the thus prepared container on the lower container, the container rotates easily about its vertical axis, in particular because of the shape of the coupling pieces, and the lower coupling projections of the coupling pieces lock with the locking catches into the corner fittings of the lower container. This results in a secure locking of the containers stacked one atop the other during movements of the ship. Because of rolling movements of the ship in its travel, the containers tilt in the transverse direction. As a result, one long side of the container is under pressure load, while the opposite long side is under tension load. The coupling pieces on the pressure side of the container prevent the shifting of the entire container, such that the locking catch on the tension side cannot disengage from the upper corner fitting of the lower container and thus reliably transfers the tensile forces between the upper and lower containers on the tension side. Containers stacked in the bow section of a ship, in which the case may arise that tensile loads occur on all four coupling pieces because of nosing of the ship under circumstances, are also held securely. Because of the mass moment of inertia of the respective upper container, this will not by itself rotate against the respective lower container, so that a secure locking is also given under these circumstances.

According to a design embodiment of the present invention, the length of the other (lower) coupling projection is slightly shorter than the length of an associated elongated hole of the associated corner fitting of the other (lower) container. Correspondingly, the maximum width of the locking catch should also be slightly less than the width of the elongated hole. The lower coupling projection thus just passes through the elongated hole, which is completely sufficient for the desired coupling and uncoupling of the containers stacked one atop the other; it opposes an undesired uncoupling because of movements of the ship, however. This is further supported if leading edges of the other (lower) coupling projection have a contour that corresponds to the contour of the assigned elongated hole in this area. Consequently, the coupling piece has only a very small play in the longitudinal direction, so that the coupling piece is also blocked in the transverse direction. There is thus further improved securing against shifting of the coupling piece in the transverse direction, so that the secure joining of the containers stacked one atop the other is further improved by means of the locking catch.

According to another design embodiment of the present invention, a lead-in taper is arranged under the locking catch for the facilitated introduction of the lower coupling projection into the associated elongated hole at the container corner fitting. This lead-in taper tapers downwards, so that it brings about coupling for the correct positioning of the lower coupling projection, and thus of the entire coupling piece.

At the junction between the stop plate and the lower coupling projection, a lead-in chamfer should be arranged on the long side of the lower coupling projection facing away from the locking catch. After the coupling piece has been correctly positioned by the lead-in taper for insertion into the

elongated hole, the lead-in chamfer is now used by the further lowering of the upper container. By means of the lead-in chamfer, the coupling piece is pushed, especially by means of further lowering of the upper container, in the direction in which the locking catch points and consequently brings about the coupling of the upper container with the lower container (locking position). Furthermore, the coupling piece has only a little play in the transverse direction of the container because of the lead-in chamfer, so that the locking catch always reliably undercuts the elongated hole of the upper corner fitting of the lower container. Thus, a further improvement is provided in the secure binding of the containers stacked one atop the other.

The lead-in chamfer has an angle corresponding [typo in original - Tr.Ed.] to a chamfer at the upper elongated hole of the upper container corner fitting and thus fits tightly in the elongated hole. As an alternative, only the upper area pointing to the stop plate corresponding to the length of the chamfer at the elongated hole may be provided with an angle corresponding to the chamfer at the elongated hole. A flatter curve as compared with this chamfer is then provided under this chamfer. Consequently, the vertical distance between the locking catch and the stop plate can be reduced, as a result of which the vertical play of the coupling piece in the corner fitting is also simultaneously reduced. Consequently, the certainty of lashing the containers joined with one another onboard the ship is further increased.

To make the uncoupling easier, a sloping shoulder may be arranged on the top side of the locking catch. This variant, in particular, especially suitable for fully automatic devices. However, as an alternative, the top side may also have a horizontal top side. In order to make the uncoupling easier then, the locking catch should be provided with a side wall directed sloping inwardly. This variant

is particularly suitable for midlocks and may be used in addition or as an alternative to the sloping shoulder on the top side of the locking catch.

According to an alternative exemplary embodiment of the coupling piece according to the present invention, the locking catch is designed such that it is cross-slidable in relation to the lower coupling projection. When the lower coupling projection is inserted into the upper elongated hole of the upper corner fitting of the container, the locking catch is pushed back against the lower coupling projection and then, after insertion in the elongated hole, is pushed back again into the locking position by means of the force of a spring. This variant is advantageous with containers very close to one another onboard, since the containers now no longer have to be rotated about their vertical axis during loading because of the "alternative" locking catch.

The present invention is explained in detail below based on exemplary embodiments shown in the drawings, in which:

Figure 1 shows a partially cutaway, side view of a coupling piece having the features of the present invention;

Figure 2 shows a front view of the coupling piece according to Figure 1;

Figure 3 shows a schematic view of two containers during the loading of same, shortly before locking;

Figure 4 shows a schematic view of the containers during unloading shortly after unlocking;

Figure 5 shows a detail of the containers during the loading and unloading of the containers;

Figure 6 shows a detail of the containers stacked one atop the other in the locked state;

Figure 7 shows a schematic top view of two containers during locking and unlocking;

Figure 8 shows a schematic top view of the lower container in the locked state;

Figure 9 shows a partially cutaway, side view of a second exemplary embodiment of a coupling piece having the features of the present invention;

Figure 10 shows a front view of the coupling piece according to Figure 9;

Figure 11 shows two containers stacked one atop the other with a coupling piece according to Figure 9 when unloading shortly before unlocking;

Figure 12 shows a side view of a detail of the containers according to Figure 11 shortly before unlocking;

Figure 13 shows a front view of the detail of the container according to Figure 12;

Figure 14 shows a top view of the detail of the container according to Figure 12;

Figure 15 shows a front view of a third exemplary embodiment of a coupling piece having the features of the present invention;

Figure 16 shows a front view of another exemplary embodiment of a coupling piece having the features of the present invention.

The embodiments of a coupling piece according to the present invention shown in Figures 1 through 8 are particularly suitable as so-called fully automatic device[s] 20, also designated as unilock[s]. The fully automatic device 20 comprises a central stop plate 21 and coupling projections 22 and 23 extending upwards and downwards therefrom. On the upper coupling projection 22 are arranged lateral projections 24, 25, which grip behind a lower elongated hole of a container corner fitting, so that they are interlocked within this corner fitting. A locking piece 26, which can be pivoted to the side into the plane of the stop plate 21 by means of a hand lever 27, is used to lock and unlock the upper coupling projection 22 in this container corner fitting. To this extent, the present fully automatic device 20 still corresponds [sic, "einspricht" is a typo for "entspricht" - Tr.Ed.] to a conventional midlock, as is shown, for example, in DE 298 11 460 U1, and, like this midlock, is inserted into the lower corner fitting of the upper container by the stevedore.

Since the upper elongated holes on the upper corner fittings are always directed in the longitudinal direction of the container just as the lower elongated holes of the lower corner fittings in standard

containers, the hand levers 27 are always turned toward the container front side (the front provided with doors or the closed back). Therefore, within the framework of this specification and the claims the side of the hand lever 27 is designated as the front V, the opposite side is designated as the back R and the sides adjacent hereto, pointing from the front V to the back R, are designated as the long sides L.

The lower coupling projection 23 is designed in a special manner. This coupling projection 23 has a projecting locking catch 28. As can be seen in Figures 1 and 2, the locking catch 28 is assigned to one of the two long sides L, especially the right-hand long side L according to the view in Figure 2. The locking catch 28 is arranged laterally, so that an opening of the container corner fitting assigned to the front sides of the container remains free for hooking in lashing means.

Under the said locking catch 28, the coupling projection 23 is provided with a downwardly directed lead-in taper 29. At the junction from the lower coupling projection 23 to the stop plate 21, a lead-in chamfer 30 is provided on the long side L of the lower coupling projection 23 facing away from the locking catch 28. The lead-in chamfer 30 causes the respective fully automatic device 20 to shift to the right in the view according to Figure 2 when the fully automatic device 20 is inserted into the upper corner fitting of the lower container, i.e., when the upper container is placed on the lower container.

On the side of the lower coupling projection 23 opposite the lead-in chamfer 30, a chamfer 31 is provided at the junction between the coupling projection 23 and the stop plate 21. This chamfer is primarily provided for reasons of stability. However, as can be seen in Figure 2, the chamfer 31, as

well as the upper part of the lead-in chamfer 30, correspond exactly to a chamfer 32 at the elongated hole 33 of the corner fitting.

The length l of the lower coupling projection 23 is only slightly less than the length of the elongated hole 33. The width b of the locking catch 28 at its widest point is likewise only slightly less than the width of the elongated hole 33. The projecting depth t of the locking catch 28 is thus only slightly less than the distance a of the side surface of the coupling projection 28 facing away from the locking catch 28 from the associated inside wall of the elongated hole 33 (Figure 2).

To make unlocking easier, the locking catch 28 is provided with an outwardly sloping shoulder 34. When the upper container and thus the fully automatic device 20 are raised, the shoulder 34 abuts against the bottom of the container corner fitting, so that the fully automatic device 20 is pressed to the left in the view according to Figure 2 and is thus disengaged from the elongated hole 33.

Figures 3 through 8 show the loading and unloading of containers using the fully automatic device 20. Figure 3 shows a container 35 already parked, e.g., onboard ships, onto which another container 36 shall be placed. The other container 36 is shown in the position shortly before the locking on the lower container 35. As can be recognized in Figure 5, the fully automatic device 20 sets down on the upper edge of the elongated hole 33 with the lead-in taper 29 and it is then locked by means of a movement of the entire upper container 36 by means of a longitudinal rotation of the container 36 about its vertical axis (see Figure 7, arrow 37). The sequence of movements of the fully automatic device is illustrated by the combination of arrows 38 in Figures 4 and 5. The front fully automatic devices 20 first slide to the left (arrow 38.1) during the locking because of the lead-

in taper 29, while the rear fully automatic devices 20 slide to the right. By means of further lowering of the upper container 36, the fully automatic device 20 falls vertically at first (arrow 38.2). By means of even further lowering of the upper container 36, the front fully automatic devices 20 finally slide to the right (arrow 38.3), while the rear fully automatic devices 20 analogously slide to the left into their respective locking position. Figure 6 shows the containers 35, 36 finally in the completely locked position.

Analogously to Figure 3, Figure 4 shows the upper container 36 shortly after unlocking during the unloading of the container 36. The container [36] is in turn rotated slightly about its vertical axis in relation to the lower container 35. The front fully automatic devices 20 slide upwards to the left corresponding to arrow 40 in the view according to Figure 4 and Figure 5 out of the elongated holes 33, while the rear fully automatic devices 20 slide out of the elongated holes 33 upwards to the right according to arrow 41 in Figure 4. The container 36 thus rotates clockwise according to arrow 42 in Figure 7 during unloading. These directions according to the arrows 38, 40, 41, 42 arise, since the fully automatic devices 20 assigned to the front corner fittings 44 of the containers 35, 36, on the one hand, and the locking catches 28 of the fully automatic devices 20 assigned to the rear corner fittings 43, on the other hand, point in opposite directions with their locking catches 28.

It can be easily seen in Figure 8 that front and rear leading edges 39 of the fully automatic device, more exactly of the lower coupling projection 23, have a contour at least in the area of the elongated hole 33 of the upper corner fitting 43, 44 of the lower container 35 that corresponds to the contour of the elongated hole 33. Concretely, an arc-shaped contour is provided.

If the fully automatic devices 20 assigned to the rear corner fittings 43 or the ones assigned to the front corner fittings 44 are inadvertently inserted the wrong way around, this is also not the end of the world. The container 36 is then lowered and raised entirely offset laterally during the locking and unlocking. However, such a situation should be avoided by the careful work of the stevedore. If only one of the fully automatic devices is inserted the wrong way around, such that the locking catches 28 assigned to the front corner fittings 44 and to the rear corner fittings 43 point towards one another or point away from one another, the container cannot be locked at all. The stevedore notices this, so that the container can be raised again and the mistake can then be corrected. At any rate, a situation, in which the fully automatic device locks and then unlocks only with great difficulty and thus the container cannot be unloaded, cannot occur.

A coupling piece that is particularly suitable as a midlock 45 is shown in Figures 9 through 14. The midlock 45, in its essential components, corresponds to the fully automatic device 20 according to Figures 1 through 8, so that comparable components in Figures 9 through 14 are designated with the same reference numbers as in Figures 1 through 8. However, as can be seen in Figure 10, a locking catch 46 of the midlock 45, which is likewise arranged laterally, does not have a sloping shoulder, but rather has a somewhat horizontal top side 47. An outer side wall 48 of the locking catch 46 is guided sloping inwardly on the side facing away from the hand lever 27, as this can be particularly easily seen in Figure 14.

The unlocking of the upper container 36 from the lower container 35 is shown in Figures 11 through 14. First, on the front corner fittings 44 that are freely accessible to the stevedore, a semiautomatic twistlock 49 inserted there is manually unlocked by the stevedore. Then, the

container 36 is raised with a container loading crane (arrow 50). The front corner fittings 44 of the containers 35, 36 lift off from one another and the container 36 tilts. Consequently, the midlock 45 also tilts, as can be easily seen particularly in Figure 12. Because of the sloping side wall 48, the midlock 45 is now pressed to the left in the view according to Figure 13 (arrow 51), as a result of which the locking catch 46 is released from the elongated hole 33.

The locking of the container 36 and of the midlock 45 during the loading of the container 36, i.e., when same is placed on the lower container 35, is performed analogously to the fully automatic device 20 explained based on Figures 1 through 8.

Figure 15 shows an exemplary embodiment, in which the lead-in chamfer is first provided with a steeper chamfer 52. The angle of this chamfer (52) corresponds to the angle of the chamfer 32 at the elongated hole 33 of the container corner fitting. Under this chamfer 52, the lead-in chamfer 30 passes over into a chamfer 53 with an angle that is flatter compared to the chamfer 52. This variant has the advantage that the vertical distance between the bottom of the stop plate 21 and the upper shoulder 34 on the locking catch 28 can be shortened. This also results in a smaller vertical play of the coupling piece. The containers thus joined with one another for safety is [sic, are - Tr.Ed.] thus improved.

In the exemplary embodiment shown in Figure 16 the locking catch 54 is displaceable against the lower coupling projection 23. Concretely, the locking catch 54 can be moved slightly sloping upwards in the direction of the lead-in chamfer 30. This variant is advantageous if the containers stacked one atop the other are so close to one another onboard ships that they cannot be rotated

about their vertical axis for the joining and/or separating of the containers during the loading and/or unloading of the containers. When the upper container 35 [sic, 36?] is placed on the lower container 36 [sic, 35? - Tr.Ed.], as before, the lead-in taper 29 on the lower coupling projection 23 is first inserted into the elongated hole 33. Then, a lower slope sets down on the chamfer 32 at the elongated hole 33. As a result of this, the locking catch 54 is pressed backwards against the force of a spring 55 and comes into the position shown by broken lines in Figure 16. The lower coupling projection 23 can now slide into the elongated hole 33. The locking catch 54 is then pushed back again by means of the force of the spring 55 into the starting position. The coupling piece is locked.

In the coupling piece shown in Figure 16, the locking catch 54 is concretely pushed back into the elongated hole 33 only during the loading of the container, i.e., during the insertion of the lower coupling projection 23 into the elongated hole 33. Because of the upwardly sloping course of the direction of displacement of the locking catch, which corresponds approximately to the angle of the upper shoulder 34, a force directed almost at right angles to the moving direction of the locking catch 54 occurs on the locking catch 54 during the unloading. Thus, the containers must be rotated slightly during unloading. However, it is guaranteed by this measure that the containers stacked one atop the other do not independently unlock due to forces acting on them while at sea. Difficulties possibly occurring during the unloading of the container because of containers standing close to one another take second place to safety during the transport onboard ships. At the same time, it can be seen that the course of the lower slope 56 compared to the direction of displacement of the locking catch 54 is slightly greater than a right angle. Consequently, an optimal force on the locking catch 54 is reached for pushing back during the loading.

List of Reference Numbers:

20Fully automatic device42Arrow

21Stop plate43Corner fitting

22Coupling projection44Corner fitting

23Coupling projection45Midlock

24Projection46Locking catch

25Projection47Top side

26Locking piece48Side wall

27Hand lever49Twistlock

28Locking catch50Arrow

29Lead-in taper51Arrow

30Lead-in chamfer52Chamfer

31Chamfer53Chamfer

32Chamfer54Locking catch

33Elongated hole55Spring

34Shoulder56Slope

35ContaineraDistance

36ContainerbWidth

37ArrowlLength

38Combination of arrowstDepth

39Leading edgeVFront

40ArrowRBack side

41ArrowLLong side